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# PATENT ABSTRACTS OF JAPAN

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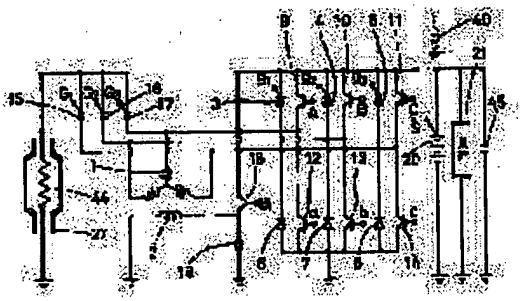
## (54) POWER SOURCE FOR VEHICLE

(57)Abstract:

PURPOSE: To provide a power source for a vehicle in which a brake generation is executed while maximizing a specific output of a rotary electric machine and a storage battery can be charged at any time while preferentially regenerating the battery in this case.

CONSTITUTION: A substantial constant-voltage field control by a field control transistor 18 is inhibited in principle at the time of braking, and maximum power is supplied to a braking resistor 44 through braking rectifiers 15-17 by high-voltage generating of an armature winding 1.



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## CLAIMS

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[Claim(s)]
[Claim 1] A field winding wound around a rotator A semiconductor closing motion element for field control which can be equipped with a dynamo-electric machine which has an armature winding, and can adjust field current to said field winding Power of said armature winding is rectified and it is the charge rectifier which can charge an accumulation-of-electricity means of the dynamo-electric machine exterior. Although it is the power unit for vehicles equipped with the above, and a charge rectifier rectifies armature-winding power and an accumulation-of-electricity means is charged in order to usually maintain voltage of said accumulation-of-electricity means at a proper range When it is at the vehicles braking time and voltage of an accumulation-of-electricity means is in a proper range While a thyristor machine for braking rectifies armature power and energizing a resistor for braking, it is characterized by having a control means which turns on and off a semiconductor closing motion element for field control with a duty ratio which an armature winding is made to carry out a high-voltage generation of electrical energy, and can generate maximum output power.
[Claim 2] A power unit for vehicles of claim 1 characterized by having a duty ratio control means which flows through the thyristor for charge even if it is at the braking time, and carries out intermittence high-voltage charge of said accumulation-of-electricity means while making said charge rectifier into a thyristor.
[Claim 3] A power unit for vehicles of claim 1 which put side by side a bridge of an insulated-gate form electrostatic effect transistor at said armature-winding edge with said charge rectifier, and added a motor function, or claim 2.
[Claim 4] Said accumulation-of-electricity means is the power unit for vehicles of claim 1 characterized by becoming the parallel-connection object of a capacitor and a battery.
[Claim 5] Said resistor for braking is the power unit for vehicles of claim 1 characterized by being a heating catalyst heater.
[Claim 6] A field winding wound around a rotator A semiconductor closing motion element for field control which can be equipped with a dynamo-electric machine which has an armature winding, and can adjust field current to said field winding Power of said armature winding is rectified and it is the charge rectifier which can charge an accumulation-of-electricity means of the dynamo-electric machine exterior. Are the vehicles power unit equipped with the above, and said charge means is connected through a semiconductor closing motion element for power control after said charge rectifier. A current sensor which detects current which establishes a rotational-speed detection means of said rotator, and flows for said accumulation-of-electricity means is prepared. While establishing a field control means to make said semiconductor closing motion element for field control open and close so that a peak generation of electrical energy which optimizes a ratio of copper loss and iron loss of said dynamo-electric machine according to a rotational frequency signal of said rotational-speed detection means may be enabled It is characterized by establishing a power control means which makes said semiconductor closing motion element for power control open and close so that it may be made a duty ratio which suits current which flows for said accumulation-of-electricity means according to a current signal of said current sensor.
[Claim 7] A power unit for vehicles according to claim 6 characterized by connecting resistance for dynamic braking through a semiconductor closing motion element for power control after said charge rectifier.
[Claim 8] A power unit for vehicles according to claim 6 characterized by connecting a motor for ** energy through a semiconductor closing motion element for power control after said charge rectifier.

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[Translation done.]

* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] Besides this invention using a dynamo-electric machine for the charge system for common electric loads about the power unit for vehicles for a passenger car, a truck, etc., a circuit is connected also to the resistor for dynamic braking at the time of braking, it carries out the high-voltage generation of electrical energy of the dynamo-electric machine by full power, and it is related with the power unit for vehicles which acquires big engine damping force.
[0002]
[Description of the Prior Art] As conventional technology, an armature winding is short-circuited or there is an electrical machinery damping device of the method which gives the rotating magnetic field of hard flow to rotation of a rotator. Although an attached peripheral control unit tended to carry this in ****** simple, the opposite side dynamo-electric machine itself needs to carry out absorption thermolysis of the braking energy, and it has heat-capacity constraint of the dynamo-electric machine itself, and was not able to earn stop ability.
[0003] In recent years, the technology which the tendency which makes the dynamo-electric machine of starting and charge one from a viewpoint of energy saving, and attains systematization with an engine and vehicles is increasing, and is revived in a battery by making transit braking energy into generated output as one technology of them is well-known. Since there are few battery ratings in comparison and braking energy cannot be inhaled especially, a resistance load is made to consume a part for a surplus, and the technology of aiming at charge attracts attention as a high thing of an effect from energy saving, obtaining a braking function. However, since each conventional technology of this method was a thing made to generate by the low battery of the abbreviation regularity suitable for charge, the difficulty that only small damping force is acquired was considering the physique and weight insufficiently [ the ratio of the specific power as a dynamo-electric machine, i.e., an output, and a size ] therefore.
[0004] Moreover, with increase and vehicles improvement in the speed of vehicles weight in recent years, the load of friction brake became large, and even if it results in a passenger car, the auxiliary brake has been needed. Although there was an electric-braking machine like an electro-magnetic retarder as conventional technology, the rotating machine itself needed to make braking energy heat, absorption and emission of needed to be done, and big damping force was not acquired for heat-capacity constraint of the rotating machine itself.
[0005]
[Problem(s) to be Solved by the Invention] It aims at considering as the equipment which can be charged at any time, not rubbing this invention in that case, but giving priority to the regeneration to a battery while carrying out braking generation-of-electrical-energy actuation which made specific power max by using as a dynamo-electric machine un-fixed high-voltage actuation which follows the maximum output locus which took the impedance matching of the **** dynamo-electric machine which shows drawing 3 only at the time of braking, and a load. Moreover, this invention carries out generation-of-electrical-energy actuation which made specific power max by taking and carrying out maximum output actuation of the dynamo-electric machine load for generator IMBI dance adjustment. Under the present circumstances, priority is given to the regeneration to a battery and let it be the 2nd technical problem to consume a part for that surplus by resistance loads, such as resistance for dynamic braking.
[0006]
[Means for Solving the Problem] A power unit for vehicles for solving the 1st technical problem of this invention A semiconductor closing motion element for field control which can be equipped with a dynamo-electric machine which has a field winding wound around a rotator, and an armature winding, and can adjust field current to said field winding, Although it is the power unit for vehicles which rectifies power of said armature winding and is equipped with a charge

rectifier which can charge an accumulation-of-electricity means of the dynamo-electric machine exterior, and a charge rectifier rectifies armature-winding power and an accumulation-of-electricity means is charged in order to usually maintain voltage of said accumulation-of-electricity means at a proper range When it is at the vehicles braking time and voltage of an accumulation-of-electricity means is in a proper range While rectifying armature power by thyristor for braking and energizing a resistor for braking, it is characterized by having a control means which turns on and off a semiconductor closing motion element for field control with a duty ratio which an armature winding is made to carry out a high-voltage generation of electrical energy, and can generate maximum output voltage. And at the time of braking, abbreviation constant-voltage field control by semiconductor closing motion element for field control is forbidden in principle by the above configuration, and maximum output voltage supply to a resistor for braking is performed by high-voltage generation of electrical energy through a thyristor for braking. Moreover, when putting side by side a bridge of an insulated-gate form electrostatic effect transistor at said armature-winding edge with said charge rectifier and adding a motor function, the reliability of equipment can be secured that it is hard to carry out failure like MOS with a low loss fast operation in the case of a high-voltage generation of electrical energy at the time of braking.
[0007] Moreover, a power unit for vehicles for solving the 2nd technical problem of this invention Said charge means is connected through a semiconductor closing motion element for power control after said charge rectifier. A current sensor which detects current which establishes a rotational-speed detection means of said rotator, and flows for said accumulation-of-electricity means is prepared. While establishing a field control means to make said semiconductor closing motion element for field control open and close so that a peak generation of electrical energy which optimizes a ratio of copper loss and iron loss of said dynamo-electric machine according to a rotational frequency signal of said rotational-speed detection means may be enabled It is characterized by establishing a power control means which makes said semiconductor closing motion element for power control open and close so that it may be made a duty ratio which suits current which flows for said accumulation-of-electricity means according to a current signal of said current sensor. And according to the above-mentioned configuration, it is possible to heighten a generation-of-electrical-energy output of not only the time of braking but a dynamo-electric machine, and high power is obtained.
[0008]
[Example] Drawing 1 is the circuit diagram of 1 operation of this invention equipment. The field winding 2 of the rotator to which an armature winding 1 drives the stator of a dynamo-electric machine with nothing and the internal combustion engine for vehicles without illustration can form NS pole according to field current. Adjustment of the field current which flows from a battery 20 is enabled by turning on and off of the transistor 18 for field control by which series connection was carried out. The fly wheel diode 19 is connected to a field winding 2 and juxtaposition.
[0009] The three phase coil edge of an armature winding 1 is connected to the anode of the three phase thyristors 3, 4, and 5 for charge, respectively, and the cathode of these thyristors is connected to the positive electrode of a battery 20. Moreover, the three phase coil edge of an armature winding 1 is connected to the N layer pole of the three phase diodes 6, 7, and 8, the P layer pole of these three phase diode is collectively connected to the negative electrode of a battery 20, that is, the positive side of charge rectifiers 3-8 has used the thyristor and the negative side as diode. The general electric load 21 for vehicles and a capacitor 45 are connected to a battery 20 and juxtaposition.
[0010] The anode of the three phase thyristors 15, 16, and 17 for braking is connected to the armature winding 1, and each cathode of these thyristors is put in block, and is connected to the non-grounding edge of the resistor 44 for braking. The resistor 44 for braking is formed in the bypass exhaust pipe 27, and has made the heating catalyst heater serve a double purpose. The resistance RL of the resistor 44 for braking is set up like the degree type so that it may pass along the maximum output locus of the power peak property of a dynamo-electric machine, in order to carry out impedance matching to a dynamo-electric machine and to make maximum output power supply as shown in drawing 3 .

P=V -- 2 OUT/RL, VOUT is the output voltage of a dynamo-electric machine, and P is output power here.
[0011] The transistors 9-14 for rotating-magnetic-field generating form the transistor bridge in the case of carrying out a motor operation for a dynamo-electric machine, the vertical edge of this transistor bridge is connected to the positive negative electrode of a battery 20, and juxtaposition, and the middle point of this transistor bridge is connected to the three phase coil edge of an armature winding 1. Moreover, said transistors 9-14 are used as the insulated-gate form electrostatic effect transistor (IGBT).
[0012] Drawing 2 is the block diagram of the control circuit by the simplified logical circuit model. The input of gate signals g1, g2, and g3 of the three phase thyristors 3, 4, and 5 for charge is enabled from the gate drive circuit 47. The input of gate signals G1 and G2 and G3 of the three phase thyristors 15, 16, and 17 for braking is enabled from the gate drive circuit 46. The input of the base driving signal B1 of the transistor 18 for field control is enabled from OR circuit 43.

[0013] A smoothing circuit 22 graduates battery voltage S, and introduces output voltage into a comparator circuit 33. A comparator circuit 33 compares reference voltage Vref for the output voltage of a smoothing circuit 22, and generates the output signal according to a comparison result.
[0014] It emits the damping force command BR while the braking actuation commander circuit 24 outputs zero signal when a brake pedal is not stepped on, and it outputs one signal, when a brake pedal is stepped on. The duty ratio control circuit 23 generates the signal of the duty ratio which an armature winding 1 is made to carry out a high-voltage generation of electrical energy, and can generate maximum output power, when said damping force commander is inputted.
[0015] The motor actuation commander circuit 26 is used when a dynamo-electric machine wants to operate as a synchronous motor, and as it gives rotating magnetic field quicker than the rotational speed of a field winding 2 to an armature winding 1, it gives the base driving signals A, B, C, a, b, and c to the transistors 9, 10, 11, 12, 13, and 14 for rotating-magnetic-field generating. Moreover, the motor actuation commander circuit 26 generates one signal at the time of ON (at the time of use), and generates zero signal at the time of OFF (at the time of un-using it), and emits the excitation force commander M at the time of ON.
[0016] In addition, the output signal of a comparator circuit 33 is inputted into the top terminal of AND circuit 36 in drawing 2 , and 1 of the braking actuation commander circuit 24 and 0 signal is inputted into the bottom terminal by negative logic. The output signal of AND circuit 35 is inputted into the top terminal of AND circuit 37 by negative logic, and the output signal of AND circuit 36 is inputted into the bottom terminal. The output signal of the duty ratio control circuit 25 is inputted into the top terminal of AND circuit 38, and the output signal of AND circuit 36 is inputted into the bottom terminal by negative logic. Moreover, the output signal of AND circuits 37 and 38 is inputted into the top terminal of OR circuit 43 through OR circuit 39.
[0017] Usually, since there are not the damping force commander BR and the excitation force commander M and zero signal is outputted from the commander circuits 24 and 26, the three phase thyristors 15, 16, and 17 for braking turn off, and charge a battery 20 and a capacitor 45 by setting another three phase thyristors 3, 4, and 5 for charge to ON in order to maintain at a proper range the voltage of the battery 20 which makes an accumulation-of-electricity means, and a capacitor 45. And when the voltage S of a battery 20 is less than reference voltage Vref, the base driving signal from OR circuit 43 outputs to the base of the transistor 18 for field control, and when voltage S exceeds reference voltage Vref, and the base driving signal B1 does not output, field control is carried out so that a battery 20 and a capacitor 45 may become an abbreviation constant voltage.
[0018] At the time of vehicles braking, one signal outputs while the braking commander BR outputs from the braking actuation commander circuit 24. This one signal is inputted into the gate drive circuit 46, and the three phase thyristors 15-16 for braking are turned ON by a gate signal G1 - G3. When one signal of the braking actuation commander circuit 24 inputs into the bottom terminal of AND circuit 36 by negative logic, the above-mentioned abbreviation constant-voltage field control is forbidden to coincidence. On the other hand, when one signal of the braking actuation commander circuit 24 inputs into the top terminal of AND circuit 34, the damping force commander BR inputs into the duty ratio control circuit 23 on the other hand and the duty ratio output according to damping force occurs, it changes to the field current control mode according to necessity damping force. In this case, in an armature winding 1, voltage higher than generation-of-electrical-energy voltage is produced at the time of charge, and the resistance 44 for braking consumes the output power P decided by power peak value shown in drawing 3 . And the damping torque by the Flemming left-hand rule arises in a field winding 2 according to the current which flows to the resistance 44 for braking. Since the damping torque can earn a twice [ about / more than ] as many power ratio as this rather than it makes it generate electricity on low charge voltage as shown in this drawing, twice [ about ] as many braking effects as this can expect it.
[0019] Moreover, when the voltage S of a battery 20 is less than reference voltage Vref since one signal has inputted into AND circuit 32 from the braking actuation commander circuit 24 even if it is at said braking time, based on the output signal from a comparator circuit 33 inputting into AND circuit 32, gate signals g1, g2, and g3 occur from the gate drive circuit 47. Therefore, if intermittence energization of the three phase thyristors 3, 4, and 5 for charge is carried out at high speed, maintaining the average at charge proper voltage even if it is at the vehicles braking time, a part of braking energy can collect the armature windings 1 at the time of braking in a battery 20, without causing the surcharge of a battery 20, although it is a high voltage.
[0020] In this case, when said thyristors 3-5 carry out intermittence energization at high speed, high-voltage charge of a half wave unit will be allowed, but since the leakage inductance 40 by real wiring exists, there is no fear of giving a surge etc. to the electric load 21 of general vehicles between the three phase thyristors 3-5 for charge and diodes 6-8, and a battery 20 by this inductance 40 and the capacity effect of a battery 20.

[0021] In addition, although the high voltage joins the transistors 9, 10, 11, 12, 13, and 14 for rotating-magnetic-field generating by the high-voltage generation of electrical energy in this braking mode, since the insulated-gate mold electrostatic effect transistor (IGBT) is used for these transistors 9-14, the reliability on a surge-proof is high, and the reliability of a power unit becomes securable.
[0022] In performing motor actuation, while setting to ON the motor actuation commander circuit 26 shown in drawing 2 and outputting one signal, the excitation force command M and gate signal A-C, and a-c are outputted. And the flow of the transistors 9-14 for revolving field generating is controlled by gate signal A-C and a-c, a field winding 2 is rotated by the rotating magnetic field of an armature winding 1, and the auxiliary drive of the donkey engine of illustration abbreviation is carried out. In order to go into AND circuit 35, when zero signal goes into AND circuit 35 by negative logic from the braking actuation commander circuit 24, in order that an output may occur from this AND circuit 35 and an input signal may go into the gate drive circuit 47 through OR circuit 30, gate signals g1-g3 output one signal from this gate drive circuit 47. And gate signals g1-g3 consider thyristors 3-5 as a flow.
[0023] If the excitation force commander M of the motor actuation commander circuit 26 inputs into the duty ratio control circuit 25, the pulse output of this circuit 25 will input into the top terminal of AND circuit 38. Since AND circuit 36 does not output one signal when a comparator circuit 33 does not generate one signal, and it does not brake and the braking actuation commander circuit 24 will generate zero signal, if the voltage S of a battery 20 falls by motor drive, AND circuit 38 outputs a pulse signal and the base driving signal B1 to the transistor 18 for field control becomes the same as the pulse output of the duty ratio control circuit 25.
[0024] That is, in this example, even if a motor is operating, while priority is given to charge of a battery 20 and the gate drive circuit 47 operates, the duty ratio control circuit 25 is operating, and if the voltage S of a battery 20 falls from reference voltage Vref, charge will be performed.
[0025] Furthermore, if a braking operating mode has priority and the damping force command BR and one signal output from the braking actuation commander circuit 24 from the charge in a motor operating mode, while the base driving signal B1 will output from OR circuit 43, a gate signal G1 - G3 output from the gate drive circuit 46, and braking is performed, when a high-voltage generation of electrical energy is performed and current flows to the resistor 44 for braking.
[0026] However, if the necessity for charge arises because the voltage S of a battery 20 falls from reference voltage Vref also in the time of this braking operating mode, it will charge by outputting gate signals g1-g3 from the gate drive circuit 47. That is, it becomes possible to aim at the maximum power regeneration, securing the maximum damping force.
[0027]
[Other Example(s)] In addition, although it constituted from the 1st above-mentioned example so that the generated output of an armature winding 1 might be changed to the battery 20 and resistor 44 side for braking and it might connect using the three phase thyristors 3-5 for charge, and the three phase thyristors 15-17 for braking Like drawing 4 , even if it constitutes this from diode 3', 4', 5' and three phase diode 15', 16', 17', and a circuit changing switch 48, it cannot be overemphasized that an equivalent effect is acquired.
[0028] The 3rd example of this invention is equipped with a generator 51, a control circuit 52, a battery 20, the general electric load 21 for vehicles, and the resistance 44 for dynamic braking, and shows the configuration to drawing 5 . It is made to rotate with the engine for vehicles, the three phase bridge rectifier 53 rectifies the ac output generated in the three-phase-circuit armature winding 1, the insulated-gate form electrostatic effect transistor 54 for charge (it calls Following IGBT) and IGBT(s) 55a and 55b for braking are connected to the generator output line 50 with which a direct current is outputted, and it connects with the charge system circuit 71, the resistance 44 for braking, and the motor 70 for ** energy, respectively. Moreover, a capacitor 45 is formed between an output line 50 and a ground. The configuration of the accumulation-of-electricity system circuit 71 is explained. The outgoing end of IGBT54 for charge is connected to a battery 20 and the general electric load 21 for vehicles through the reactor 41. Moreover, among the series circuit both ends of a reactor 41 and a battery 20, the fly wheel diode 42 is connected to a generator output and hard flow. The resistance 44 for braking serves as a heating catalyst, is attached in the bypass exhaust pipe 27, and is set as the resistance which carried out IMBI dance adjustment with the generator 51. Excitation of a generator 51 is outputted to a field winding 2 through the field control transistor 18 from a battery 20. The base of Above 54, 55a, and IGBT 55b and the transistor 18 for field control is connected to the control circuit 52. A control circuit 52 consists of Pulse-Density-Modulation (PWM) drive circuits 58, 59, and 60 which drive each IGBT(s) 54, 55a, and 55b and the transistor 18 for field control and a comparator circuit 61, and a controller 63 which controls them to 62 pans like illustration. Moreover, a controller 63 inputs the position signal from the PODENSHO meter 64 attached in the brake pedal 68, and is outputting the signalling frequency from an armature winding 1 through the F/V converter 65 further.

Moreover, a rotator exciting current and the output current are inputted into the controller 63 by current sensors 67 and 69, respectively.

[0029] Actuation of the system which becomes by the above configuration is explained. At the time of transit, this generator 51 acts as a charging generator, and usually supplies power to a battery 20 and the general electric load 21 for vehicles. A generation of electrical energy operates the field control transistor 18 through PWM60 for fields by the signal from a controller 63, and carries out sink excitation of the current at a field winding 2. At this time, it adjusts by the amount of generations of electrical energy making a deflection signal the aim voltage signal from a controller 63, and terminal voltage of the actual battery 20 in a comparator circuit 61, and driving IGBT54 for charge with the duty ratio according to that difference through PWM58 for charge. The principle is briefly shown below using drawing 6 . By switching the gate signal of IGBT54 for charge, at the time of ON, IC flows from a generator 51 to IALT, and flows from a capacitor 45 to a points. At the time of OFF of IGBT54 for charge, IALT is stored in a capacitor 45 from a generator 51. Moreover, at this time, the energy stored in the rear frame torr 41 as magnetic energy flows as current to a battery 20 and the general vehicles electric load 21 through a fly wheel diode 42, and if it sees by c points, it will become serrate current like drawing 6 after all. In a generation of electrical energy of this method, the specific power of a generator 51 can be raised to the maximum. namely, -- usually -- the terminal voltage of a generator 51 -- a low battery (for example, 14v) -- if the power which can be taken out like drawing 7 is low, however controls the amount of generations of electrical energy by fixed generation of electrical energy by the output side of a generator 1 like this method -- a generator 1 -- the high voltage -- it can do-izing and it becomes possible to carry out a power peak generation of electrical energy. For example, if a power peak generation of electrical energy is carried out in drawing 7 at the time of 6000rpm, 3500w/14v=250A will be obtained by 3.5kW, i.e., the current of c points, and it will be about 2.3 times the output current 107A at the time of 14v fixed (= 1500w/14V). The output characteristics at the time of a full output are shown in drawing 8 . Next, based on drawing 9 , the method of a power peak generation of electrical energy is explained. The output power P of the generator which has internal resistance RO is P=(EO-IRO) xI. EO: No-load terminal voltage RO: Generator internal resistance I : It is a time of output voltage being EO/2 that it is expressed with the output current and P becomes max from a top type. It is expressed with a degree type and EO is EO ** n-** ** here. : No-load effective magnetic-flux ** n-i n: Rotational frequency i: It is proportional to an exciting-current rotational frequency and an exciting current. Therefore, a high-voltage generation of electrical energy is realized by carrying out duty ratio control of IGBT54 for charge so that the rotational frequency signal of a rotator and the current signal from the field current sensor 67 which were acquired from the F/V converter 65 may be inputted into a controller 63, output voltage EO / 2 of a power peak generation of electrical energy may be computed and it may be set to voltage EO/2-EO of the generator output line 50. In addition, switching frequency of duty ratio control was set to 20kHz or more, and was made into the frequency more than human being's audio range.

[0030] The adjustment by the output side by above-mentioned IGBT54 for charge and adjustment by the amount of fields of the field winding 2 with the transistor 18 for excitation control are possible for adjustment of the amount of generations of electrical energy in this configuration. In recent years, an efficient generation of electrical energy is desired for the improvement in vehicles fuel consumption, in this invention, by combining the two above-mentioned adjustment means, it can always generate electricity at the maximum effectiveness, and a necessity output can be obtained. One of them is shown below.

[0031] When output voltage is controlled by the condition of decision) by switching of IGBT54 for charge from current, a rotational frequency n (rpm) (it judges from the rotational frequency signal acquired from the F/V converter 65), and the current signal from the programmed-voltage VO(V) exciting-current io(A) (current sensor 67, the output current (it corresponds to the output current I) signal from a current sensor 69 is inputted into a controller 63, and necessity generation-of-electrical-energy power is calculated within the controller.

Necessity generation-of-electrical-energy power The generation-of-electrical-energy power required of a generator 51 side with the equal (if the loss in this DC-DC converter is disregarded) therefore I/O power of a P=VOIDC-DC converter is P. The difference in the voltage power curve by field current If is shown in drawing 10 . For example, necessity generation-of-electrical-energy power P is carried out on Points a, b, and c and d each voltage on drawing 10 , and it can be set as arbitrary voltage by generally changing field current If. There are copper loss of the following formula (1), iron loss, rectification loss, and mechanical loss in loss of a generator 51.

[0032]

[Equation 1]

it is a copper loss = diode drop. ROI2 iron loss = alpha(fBg)2+betafBg2=gammaV2 rectification loss = VFI mechanical-loss = fixed -- here -- alpha, beta, and gamma : Coefficient of a proper f : Power line period Bg: Effective flux density V : Voltage VF : Generally the contribution of copper loss and iron loss is high. Since copper loss and iron loss are the

functions of Current I and voltage V, respectively, Loss PL is expressed by the degree type (2).
[0033]
[Equation 2] When the PL=ROI2+gammaV2 loss PL becomes min, the maximum effectiveness generation of electrical energy is realized.
[0034] Since the necessity generation-of-electrical-energy power P is determined now, the relation between P, and V and I is P=VI, and Loss PL serves as a degree type.
[Equation 3] PL=RO 2+gammaV2 (P/V) [0035] They are Vmin, then [Equation 4] about V which makes PL min. It is expressed with Vmin=(ROP2/gamma) 1/4. Therefore, if field current is adjusted to the appearance to which the voltage of the generator output line 50 becomes equal to Vmin, the maximum effectiveness generation of electrical energy is realizable.
[0036] Next, the actuation at the time of braking is explained. When an operator breaks in a brake pedal 68, an angle signal is outputted to a controller 63 from the potentiometer 64 installed there. A controller 63 sets up the damping torque desired value according to a brake-pedal angle, from a current generator rotational frequency and field current, computes power peak voltage (EO/2) as a lower limit, and outputs the generator voltage equivalent to the desired value to a comparator circuit 62. In a comparator circuit 62, the PWM drive circuit 59 is adjusted so that generator output voltage may be compared with this aim voltage and both may become equal, and current is passed to the resistance 44 for braking by IGBT55a for braking. At this time, the above-mentioned charge system circuit 71 acts independently. As mentioned above, in this invention, one generator 51 can be used for both a charging dynamo and a retarder, and since high power-ization is measured because both carry out a power peak generation of electrical energy, at the time of charge, large torque is acquired at the time of a high current and braking. Moreover, at the time of braking, the output was preferentially distributed to the general electric load 21 for vehicles, and a battery 20, and the maximum energy regeneration was enabled by making only a part for a surplus consume as heat by the resistance 44 for braking (refer to drawing 11 ).
[0037]
[Other Example(s)] 1. In the **** 3 example, especially although IGBT54 for charge was used for output controls, it may not limit, but a power transistor may be used.
[0038] 2. Although the input terminal of IGBT(s) 55a and 55b for braking was prepared in the generator output line 50 in the **** 3 example, you may prepare in the power supply line of the general electric load 21 for vehicles, and a battery 20.
[0039] 3. Although the surplus energy at the time of braking was made to consume in the **** 3 example by the resistance 44 for braking which served as the overheating catalyst, it is also possible to transform braking energy into acceleration energy by the following methods.
Example 1 ( drawing 12 )
The motor 70 for ** energy is connected to the output terminal of IGBT55b for braking in **** 3 example, the rotation pressure mold compressor 72 is driven with this motor 70 at the time of braking, and high-pressure air is stored in an accumulator 73. At the time of acceleration, an engine 74 is supercharged with the air for general inhalation of air in this high-pressure air, and high torque is acquired. Since there is no engine rotation rise delay by the turbosupercharger inertia which poses a problem by the common turbo by this method, acceleration loess BONSU is good.
[0040]
[Effect of the Invention] As stated above, the power unit for vehicles of this invention The semiconductor closing motion element for field control which can be equipped with the dynamo-electric machine which has the field winding wound around the rotator, and an armature winding, and can adjust the field current to said field winding, The power of said armature winding is rectified. The charge rectifier which can charge the accumulation-of-electricity means of the dynamo-electric machine exterior, Since it has the rectifier for braking which uses it, changing at the time of this charge rectifier and vehicles braking, rectifies the power of said armature winding, and energizes the resistor for dynamic braking of the dynamo-electric machine exterior Usually, although a charge rectifier rectifies armature-winding power and an accumulation-of-electricity means is charged in order to maintain the voltage of said accumulation-of-electricity means at a proper range When it is at the braking time for vehicles and the voltage of an accumulation-of-electricity means is in a proper range While the rectifier for braking rectifies armature power and energizing the resistor for braking Since it has the control means which turns on and off the semiconductor closing motion element for field control with the duty ratio which an armature winding is made to carry out a high-voltage generation of electrical energy, and can generate maximum output power While being able to carry out braking generation-of-electrical-energy actuation which made specific power of a dynamo-electric machine max at the time of braking, there is an outstanding effect that it can charge at any time not rubbing in that case but giving priority to the regeneration to an accumulation-

f-electricity means. Furthermore, when preparing a semiconductor closing motion element after the charge rectifier vhich changes the alternating current power of a generator into a direct current, there is an outstanding effect that it is ossible to heighten the output of a generator not only by the time of braking but by power peak generation of electrical nergy, and high power is obtained.

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Translation done.]

* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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DRAWINGS

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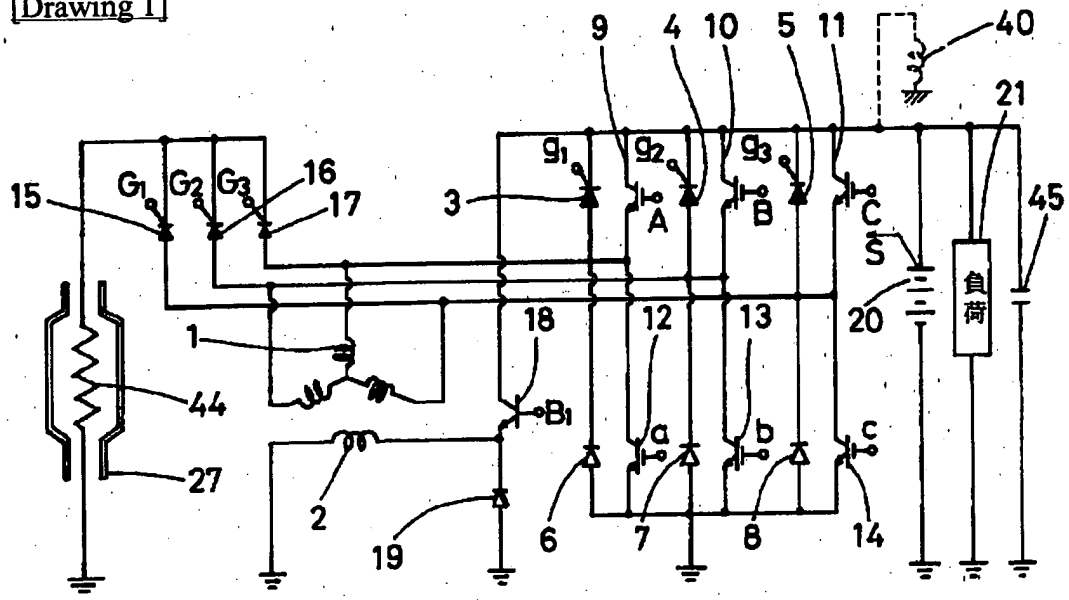
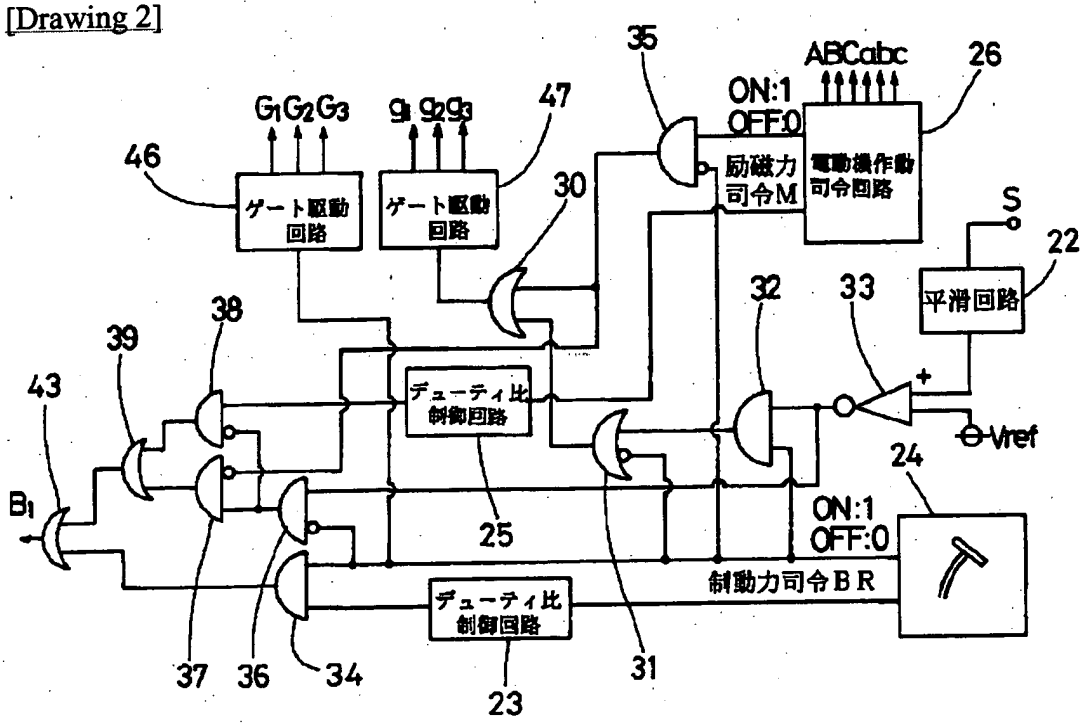
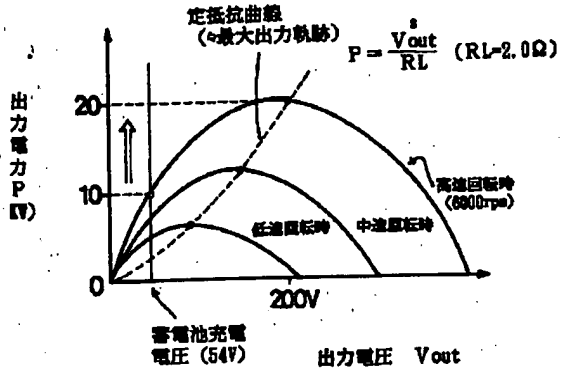
[Drawing 1]



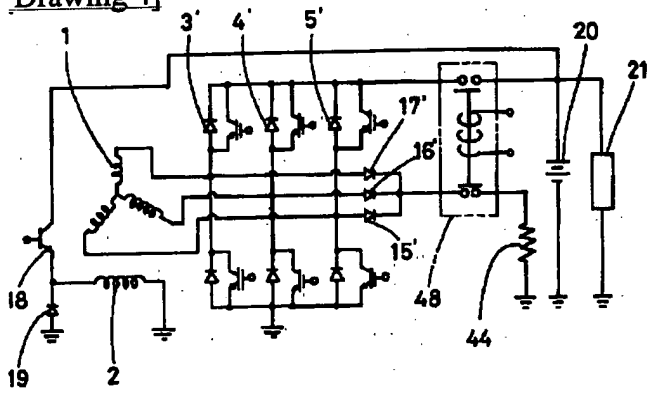

[Drawing 2]



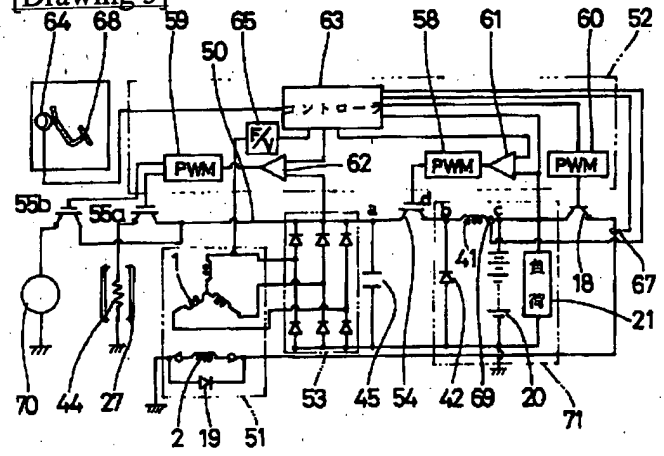

[Drawing 3]



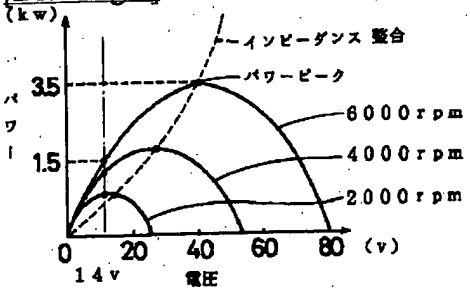

[Drawing 4]



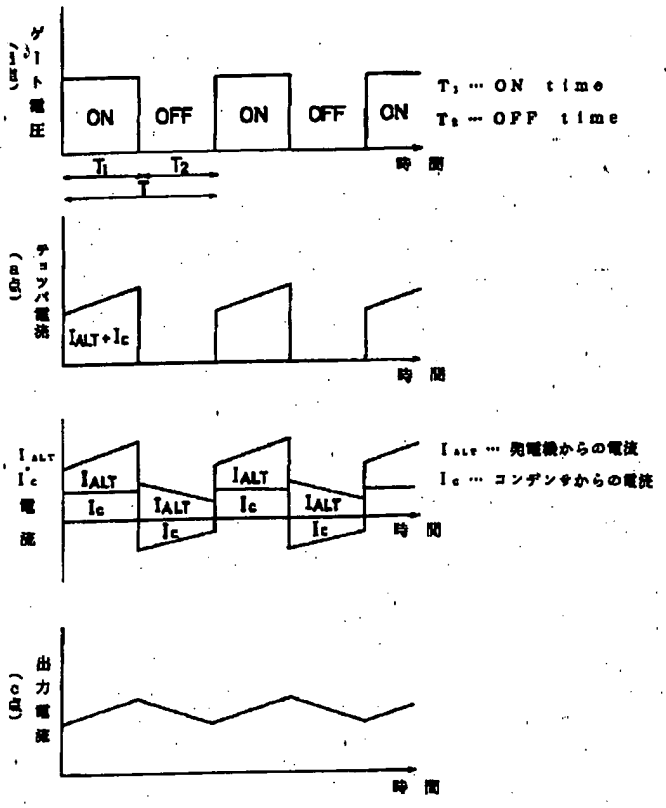

[Drawing 5]



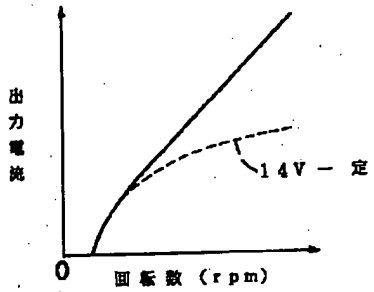

[Drawing 7]



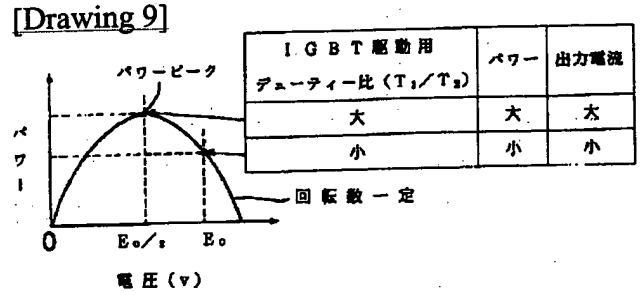

[Drawing 6]




[Drawing 8]



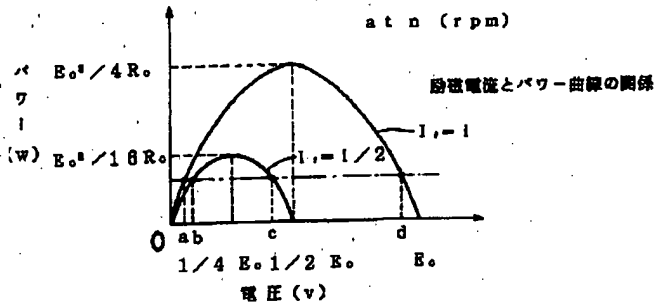

[Drawing 9]



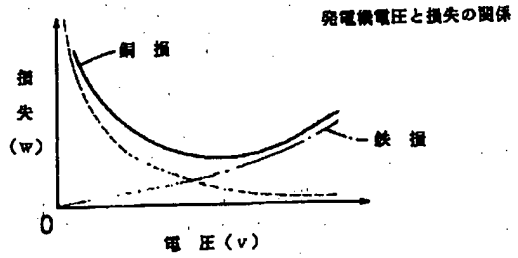

| IGBT駆動用 デューティー比（T1／T2） | パワー | 出力電流 |
|---|---|---|
| 大 | 大 | 大 |
| 小 | 小 | 小 |

[Drawing 10]

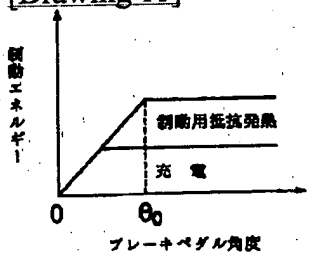
(a)



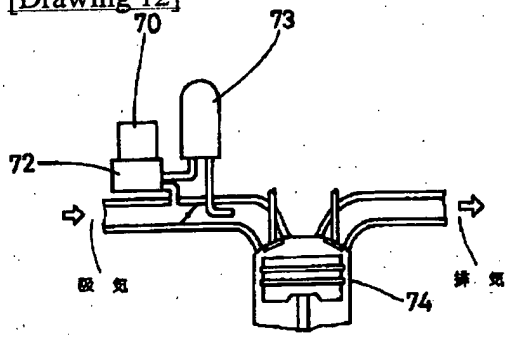

(b)




[Drawing 11]




[Drawing 12]

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[Translation done.]